

PROCEEDINGS
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A CATALOGUE OF THE MOLLUSCAN GENUS *DISTORSIO*¹
(GASTROPODA, CYMATIIDAE)

WILLIAM K. EMERSON
Museum of Paleontology, University of California

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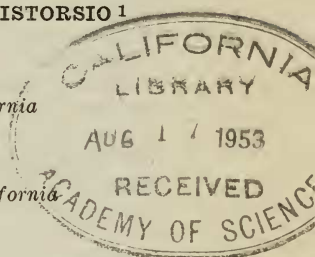
ELTON L. PUFFER
Department of Paleontology, University of California

INTRODUCTION

The primary purpose of this catalogue is to enumerate the trivial names referable to the gastropod genus *Distorsio sensu lato*. Pilsbry (1922:357) compiled a similar list in which he recorded 17 names. In the catalogue which follows, a total of 35 trivial names are allocated to the genus. Of this number, 34 were validly proposed of which 33 are available, one name is new, one is nude and one is preoccupied; two are definitely referable to the subgenus *Personella*, the remaining are placed some questionably, in *Distorsio sensu stricto*. A comprehensive phylogenetic study of the species generally placed in the genus probably would reveal the existence of several minor evolutionary lineages which would merit subgeneric recognition. Though no attempt is made to evaluate the higher categories of this group, exhaustive synonymies are given for the two recognized subgenera, *Distorsio sensu stricto* and *Personella*. On the species level, with the possible exception of the strongly defined *Distorsio anus*, the type of *Distorsio*, it can be said without hesitation that the representatives of the group have undergone considerable nomenclatural vicissitudes. It is hoped that this catalogue will be of some aid in the interpretation of the rather complex nomenclatural history which confronts students of the group.

Several authors, including Pilsbry (1922:356), Woodring (1928:299), Wrigley (1932:135), and Gardner (1947:535), have speculated on the origin and routes of distribution followed by members of this distinctive genus and its allies. On the basis of available data, it is concluded that upon the establishment in the American Gulf coast region of a lineage of the *Sassia* complex from European waters, the *Personella* group originated with *Distorsio (Personella) septemdentata* of the Claiborne (Middle Eocene) and *Distorsio (Personella) jacksonensis* of the

¹Contribution from the Museum of Paleontology, the University of California, Berkeley.



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Jackson (Upper Eocene). The first true *Distorsio* appears to be *Distorsio crassidens* of the Vicksburg (Middle Oligocene)²; it is assumed to have evolved from the *Personella* stock. By late Oligocene time, the *Distorsio* complex had spread throughout the Caribbean region, reaching the Eastern Atlantic shores and migrating westward to the Eastern Pacific and eastward to the Indo-Pacific. Like most of the thermophilic Tertiary genera now living, *Distorsio* is restricted to tropical and sub-tropical waters.

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ECOLOGICAL CONSIDERATIONS

A synopsis of the limited bathymetric data available to the writers was undertaken in an attempt to arrive at a better understanding of the living forms as a basis for the interpretation of the ecological conditions under which the fossil representatives of the genus lived. The following precise records have been noted: *D. anus*—3.6 meters, Cocos-Keeling Islands, lagoon, coral patch (Abbott, 1950:79); 9.45 meters, Banda Sea, East Indies, black sand, coral (Schepman, 1909:113); shore—9.1 meters, Hawaiian Islands, coral (Edmondson, 1946:143). *D. constrictus*—5.2-18.3 meters, Monte Cristi and Jipijapa, Ecuador, sandy mud (Reeve, 1844); 73-91 meters, Santa Inez, Gulf of Calif., Mexico; 169, 128-146 meters, Gorda Bank, Gulf of Calif., Mexico; 36.5-82.5 meters off Acapulco, Mexico; 80 meters, Port Parker, Costa Rica (Calif. Academy of Sciences coll.). *D. clathrata*—40.2-263.3 meters, off Cape Hatteras, North Carolina (Johnson, 1934:114); 18.3 meters, Limon Bay, Panama (Stanford Univ. coll.). *D. decussatus*—73 meters, Arena Bank, Gulf of Calif., Mexico; 51.2 meters, 48 miles W. of Sacapulco, Mexico; 63.9 meters, 23 miles W. of San Simon Bay, Mexico; 51.2 meters, 15 miles S. of La Puerta Light, Gulf of Tehuantepec, Mexico; 109.7 meters, 74 miles S. E. of Manzanillo, Mexico; 95 meters, off Manzanillo, Mexico; 18.2-31.2 meters, 8 miles off Mazatlan, Mexico; 45.7 meters off Gorda Point, San Jose del Cado Bay, Mexico; 36.5 meters, 45 miles off Cape San Lucas, Baja California, Mexico; Champerico, Guatemala (Calif. Academy of Sciences coll.). *D. perdistorta*—30.6-45.7 meters off Tosa, Shikoku Islands, Japan (Stanford Univ. coll.). *D. reticulata*—37, 56 meters, Madura Strait, Java, gray mud, broken shell; 55 meters, Bay of Bima, Sumbawa, East Indies, mud, patches of fine coral sand; 36 meters, off Manipa Island, Molluecas, coral, sand; 54, 73 meters, off Timor, coral, sand; 36 meters, East of Dangar Besar, Saleh Bay, coral, sand, mud (Schepman, 1909:113); 18.3-36.6 meters, Malamipu, Basilan Strait, Philippine Islands (Watson, 1886:396). Though some of the records may be based on non-living material, these data suggest that

²Vredenburg (1925:234) reports the occurrence of a *Distorsio*, "*Persona reticulata* [Linnaeus] cum var. *subclathrata* d'Orbigny et *metablieta* Cossmann," in the Nari beds (Upper Oligocene) near Kotara, India. Though his material was not illustrated, Vredenburg states that it agrees closely with Fuchs' (1870:175, pl. 1, figs. 7, 8) figures of "*Tritonium subclathratum* d'Orbigny" from the Gaas (Upper Oligocene) of Italy. These records apparently indicate an early appearance for the prototype of the *D. tortuosa*-complex.

the living representatives of the genus are most commonly found in the deeper part of the eulittoral, 9-50 meters, (inner neritic) and in the sublittoral, 50-263 meters (outer neritic) zones of the benthonic system.

Smith (1937:113) states that *D. clathrata*, at certain times of the year, has been found alive in Lake Worth, Florida and upon the beaches. Edmonson (1946:143) reports that in the Hawaiian Islands *D. anus* occurs on the shore reefs, but is more common in depths of 7 to 9 meters. Being scavengers, one would expect this group to frequent a variety of bottom types. Though the available data corroborates this inference, these gastropods appear to be found most commonly in the coarser clastic sediments, particularly a coral-sand association.

Assuming that the records of *D. perdistorta* from Kii, Japan, 33°50' N., and *D. francesae* from Sydney Harbor, Australia, 33°52' S., reflect the extremes of high latitude distribution for the Recent species, a minimum low temperature tolerance of approximately 60°F. is indicated for the group on the basis of the distribution of surface isotherms.

CATALOGUE

In the catalogue below, the synonymies of the supraspecific units appear first, the trivial names are then alphabetically listed with the exact orthography used by the original authors and followed by: the initial generic allocation in brackets, the reference to the original description and pertinent references to figured specimens and occurrences, the type locality or localities originally cited, and remarks pertaining to the apparent relationship of the species with its allies.

As used in this paper, the term "paleo-subspecies" (Clark, 1945: 161; Newell, 1948:231) denotes vertical or evolutionary subspecies, i.e. fossil populations which represent closely related groups of less than specific rank and of differing geologic age. Unfortunately, due to the present lack of adequate means for precise correlation from one area to another, it is impossible to determine whether observed differences between closely related infraspecific groups of fossils are a result of contemporaneous geographic variation or of evolution during the passage of time. Though one cannot be certain whether he is dealing in the fossil record with geographical subspecies as recognized in the modern faunas and floras or with small grades of a phyletic "continuum," the writers believe it advantageous to differentiate between the apparent geographic subspecies of the Recent faunas and the paleo-subspecies of the fossil assemblages. For the sake of convenience, all subspecies recognized in the fossil record are herein considered as paleo-subspecies.

Genus *Distorsio* 'Bolten' Röding, 1798

Subgenus *Distorsio sensu stricto*

Distorsio 'BOLTEN' RÖDING, 1798, Mus. Boltenianum, p. 133; H. ADAMS and A. ADAMS, 1853, Gen. Rec. Moll., vol. 1, p. 104; DALL, 1904, Smithsonian Misc. Coll., vol. 47, p. 138; PILSBRY, 1922, Proc. Acad. Nat. Sci. Phila., vol. 73, (2), p. 356; WOODRING, 1928, Carnegie Inst. Wash., Pub. 385, pt. 2, p. 299. *Distorsia* PILSBRY, 1922, Proc. Acad. Nat. Sci. Phil., vol. 73, (2), p. 359—error for *Distorsio* 'Bolten' Röding. *Distortio* 'Bolten' H. ADAMS and A. ADAMS, 1853, Gen. Rec. Moll., vol. 1, p. 13; CONRAD, 1865, Am. Jour. Conch., vol. 1, p. 20;

MAURY, 1922, Bull. Am. Paleo., vol. 9, (38), p. 115—error for, or emendation of *Distorsio* 'Bolten' RÖDING. *Distorsus* PAETEL, 1887, Cat. Conch., ed. 4, vol. 1, p. 103—emendation of *Distorsio* 'Bolten' RÖDING.

Distortrix LINK, 1807, Besch. Natural-Samml. Rostock, p. 122, type species: (by subsequent designation, Dall, 1904:133 *Murex anus* Linné; DALL, 1889, Bull. Mus. Comp. Zool., vol. 18, (6), p. 221; DALL, 1889, Bull. U. S. Nat. Mus., no. 37, p. 132; DALL and SIMPSON, 1901, U. S. Fish Comm. Bull. for 1900, vol. 1, p. 416; MAURY, 1917, Bull. Am. Paleo., vol. 5, p. 271; Dall, 1904, Smithsonian Misc. Coll., vol. 47, p. 133; FAUSTINO, 1928, Summ. Philippine Mar. and Fresh-Water Moll., p. 232; NICKLÈS, 1950, Man. Ouest-Africains, vol. 2, p. 86, *Distortix* PAETEL, 1875, Fam. Gatt. Moll., p. 71—error for *Distortrix* Link.

Persona MONTFORT, 1810, Conch., vol. 2, p. 602, type species: (by original designation) *Murex anus* Linné; BELLARDI, 1872, Mem. Acad. Sci. Torino, ser. 2, vol. 2, p. 262; KOBELT, 1878, Jahrb. Deutschen Malak. Gesellschaft, vol. 5, p. 370; FISCHER, 1884, Man. de Conch., p. 655; VAN DER VLERK, 1931, Leidsehe Geologische Mededeelingen, vol. 5, p. 240. *Personna* PAETEL, 1875, Fam. Gatt. Moll., p. 157—error for *Persona* MONTFORT.

Distorta PERRY, 1811, Conch., pl. 10, type species (here designated) "*Distorta rotunda* Perry" = *Murex anus* Linné; Schumacher, 1817, Ess. Vers. Test., pp. 76, 249, type species: (by original designation) "*Distorta rugosa*" SCHUMACHER = *Murex anus* LINNÉ.

Type species: (by subsequent designation,³ Pilsbry, 1922, p. 357) *Distorsio anus* (LINNÉ = *Murex anus* LINNÉ, 1758, Recent, Indo-Pacific.).

Subgenus *Personella* Conrad, 1865

Personella CONRAD, 1865, Am. Jour. Conch., vol. 1, p. 21; Dall, 1904, Smithsonian Misc. Coll., vol. 47, (1475), p. 130; Palmer, 1937, Bull. Am. Pal., vol. 7, (32), p. 260; GARDENER, 1947, U. S. Geol. Surv., Prof. Paper 142-H, p. 534; HARRIS and PALMER, 1947, Bull. Am. Paleo., vol. 30, (117), p. 335.

Type species: (by monotypy) *Distortio* [sic] (*Personella*) *septemdentata* GABB, 1860, Eocene of Texas.

acuta [*Distorta*] PERRY, 1811, Conch., or Nat. Hist. of Shells, pl. 10, fig. 1.

Type locality: "New South Wales"

Remarks: On the basis of Perry's illustration, this species should be referred to *D. reticulata* RÖDING, 1798; IREDALE (1929:344) interpreted the figure to represent the West Indian species, *D. clathratum* (LAMARCK, 1816).

anus [*Murex*] LINNÉ, 1758, Syst. Nat., ed. 10, p. 750; REEVE, 1844, Conch. Icon., vol. 2, *Triton*, pl. 12, fig. 44; Tryon, 1881, Man. of Conch., vol. 3, p. 35, pl. 17, fig. 173; M. Smith, 1948, *Triton* and Harp Shells, p. 21, pl. 8, fig. 8.

³G. D. Harris and K. Van W. Palmer, Bull. Am. Paleo., vol. 30, (117), p. 335, 1947, cite the invalid designation of J. E. Gray (Proc. Zool. Soc. London, 1847, p. 133) as antedating that of Pilsbry. Gray indicates the type of *Persona* Montfort, with "*Distortio* A, Bolten, 1798" and "*Distorta*, Schum, 1817" listed as junior synonyms.

Type locality: "Asiatic Ocean"

Occurrences: Recent Indo-Pacific faunal province; Red Sea (SMITH, 1948).

Remarks: This handsome, widely distributed species, apparently represents a stock which developed in the Indo-Pacific area in the late Tertiary.

cancellinus [*Murex*] LAMARCK, 1803, Ann. Mus. Nat. d'Hist. Nat., Paris, vol. 2, p. 225; REEVE, 1844, Conch. Icon., vol. 2, *Triton*, pl. 12, fig. 45.

Type locality: "Southern Ocean"

Remarks: Lamarck cited this species as being a fossil from Grignon [= ? *D. tortuosa* (BORSON, 1822) from the S. W. European Miocene] and living in the "Southern Ocean," but refers to the figures of Martini (1773, pl. 41, figs. 405, 406) upon which *D. reticulata* 'Bolten' RÖDING, 1798, is based. The name is often credited to de Roissy (Sonnini's Buffon Moll., 1805) in which the original description was repeated.

clathratum [*Triton*] LAMARCK, 1816, Encyclop. Meth., pl. 413, figs. 4a, 4b, Liste p. 4; LAMARCK, 1822, Hist. Nat. An. s. Vert., vol. 7, p. 186, in part, reference to Lamarck (1816) only; GUPPY, 1866, Quart. Jour. Geol. Soc. London, vol. 228, p. 288, pl. 17, fig. 13, as "*Persona simillima* SOWERBY"; GUPPY, 1874, Geol. Mag., decade 2, vol. 1, p. 439, "list," as "*Persona simillima* SOWERBY"; DALL, 1903, Trans. Wagner Ins. Phila., vol. 3, (6), p. 1584, "list," as "*Distortrix simillima* Sowerby"; WOODRING, 1928, Carnegie Inst. Wash., Pub. 385, pt. 2, p. 300, pl. 19, figs. 2, 3, as "*Distorsio clathratus gatunensis* Toula"; WEISBORD, 1929, Bull. Am. Paleo., vol. 14, (54), p. 273, pl. 8, fig. 3, as "*Distorsio* aff. *gatunensis* Toula"; RUTSCH, 1930, Ecol. Geol. Helvetiae, vol. 23, (2), p. 607; RUTSCH, 1934, Abh. Schweiz. Paleog. Ges., vol. 54, p. 58; SCHUCHERT, 1935, Hist. Geol. Antillean-Caribbean Region, p. 376, as "*Distorsio clathratus gatunensis* Toula"; M. SMITH, 1941, East Coast Marine Shells, p. 113, pl. 42, fig. 8; NICKLÈS, 1950, Man. Oest-Africains, vol. 2, pp. 86-87, fig. 133, as "*Distorsio ridens* REEVE." Not *Triton clathratus* SOWERBY, 1833.

Type locality: South American seas (LAMARCK, 1822:186).

Occurrences: Miocene—"Miocene Cumana, Venezuela" (GUPPY, 1874); Bowden formation, Jamaica (DALL, 1903; WOODRING, 1928); near Usiacuri, Atlantico, Colombia (WEISBORD, 1929); Tuxtepec formation, Vera Cruz, Oaxaca, and Chiapas, Mexico (SCHUCHERT, 1935). "Miocene"—Punta Zamuro, Puerto Cumarebo, and Sabanas Altas, Falcón, Venezuela (RUTSCH, 1930); [Punta Gavilán, formation], Punta Gavilán, Venezuela (RUTSCH, 1934). Quarternary—Cabo Blanco near La Guaira, Distrito Federal, Venezuela (RUTSCH, 1930). Recent—Caribbean area; Gulf of Mexico; coast of West Africa (NICKLÈS, 1950).

Remarks: Both the fossil and Recent representatives of this species have been confused in the literature, see remarks under *D. gatunensis*, *D. simillima*, and *D. reticulata*. The junior author has in preparation a paper pertaining to the synonymy of this species.

clatrata [*Distorsio*] 'Bolten' RÖDING, 1798, Museum Boltenianum, pt. 2, p. 133, [*nomen nudum*].

Remarks: Although this is a nude name, RÖDING referred to this species as a variety of "Gmel. *Murex anus*. sp. 38" = *D. anus* (Linné, 1758).

constrictus [*Triton*] BRODERIP, 1833, Proc. Zool. Soc. London, p. 5; REEVE, 1844, Conch. Icon., vol. 2, *Triton*, pl. 12, fig. 41; Dall, 1909, Proc. U. S. Nat. Mus., vol. 37, (1704), p. 225; PILSBRY and OLSSON, 1941, Proc. Acad. Nat. Sci. Phila., vol. 93, p. 40, pl. 5, fig. 12; M. SMITH, 1944, Panamic Marine Shells, p. 23, no. 66; M. SMITH, 1948, *Triton* and Harp Shells, p. 22, pl. 8, fig. 7.

Type localities: "Montem Christi" and "Xipixapi," Ecuador.

Occurrence: Recent—Panama to Santa Elena, Ecuador (M. Smith, 1948).

Remarks: Pilsbry (1922:359) states that this Recent form from the Panamic Province was derived from the Antillean Miocene fossil, *D. simillimus* (SOWERBY, 1850) and concludes that the lineage has died out in the Caribbean. OLSSON and MCGINTY (1951: 26) recently described *D. constricta floridana* living off the coast of Florida, which, in their opinion, differs only in size with its apparent ancestor, the Miocene species *D. simillimus* (SOWERBY, 1850). WOODRING (1928: 300) treated the Bowden representatives of *D. simillimus* (SOWERBY, 1850), as a subspecies of *D. decussatus* (Valenciennes, 1832), but was of the opinion that the latter was conspecific with *D. constrictus* (BRODERIP, 1833). In contrast, PILSBRY and OLSSON (1941:40) believed that there are two distinct species, *D. constrictus* (BRODERIP, 1833), and *D. decussatus* (VALENCIENNES, 1832), living in the Panamic Province. They concluded that while the two species occur together, the former is a strongly distorted shell having the aperture, especially the inner lip, strongly tuberculated with a short but strongly recurved anterior canal; the latter species being more slender, regular, and thinner shelled with the parietal callus being smoother and with a longer and nearly straight anterior canal. It should be pointed out that in both of the aforementioned species, the spinal cord on the shoulder or periphery of the body whorl is doubled, while in *D. clathrata* (LAMARCK, 1816), and its allies, the body whorl is sculptured with regularly spaced spirals with no indications of bilirate ridges or a keel on the shoulder.

crassidens [*Triton*] CONRAD, 1848, Jour. Acad. Nat. Sci. Phila., vol. 1, ser. 2, p. 118, pl. 11, fig. 40; CONRAD, 1854, Proc. Acad. Nat. Sci. Phila., vol. 7, p. 31; CONRAD, 1865, Am. Jour. Conch., vol. 1, p. 20; COOKE, 1929, Proc. U. S. Nat. Mus., vol. 73, p. 2, list.

Type locality: Vicksburg, Mississippi (Oligocene).

Occurrences: Oligocene—"Vicksburg Group," Mississippi; Alazan clay, Vera Cruz, Mexico (Cooke, 1929).

Remarks: Inasmuch as this is the earliest known species to occur in the fossil record that is definitely referable to the genus (*sensu stricto*), it is assumed to be the ancestor of the Caribbean stock. PILSBRY (1922:360) considered this a paleo-subspecies of *D. constrictus* (Broderip, 1833).

decipiens [*Triton*] REEVE, 1844, Conch. Icon., vol. 2, *Triton*, pl. 20, fig. 102, REEVE, 1844, Proc. Zool. Soc. London, (12), p. 121.

Type locality: Mindanao Island, Philippines.

Remarks: This appears to be a variant of *D. reticulata* 'Bolten' Röding, 1798.

decussatum [*Tritonium*] VALENCIENNES, 1832, [in] HUMBOLT and BONPLAND, Recueit Obs. Zool., vol. 2, p. 306; PILSBRY and OLSSON, 1941, Proc. Acad. Nat. Sci. Phila., vol. 93, p. 40, pl. 5, fig. 9; OLSSON, 1942, Bull. Am. Paleo., vol. 27, (106), pp. 18, 20; M. SMITH, 1944, Panamic Marine Shells, p. 23, no. 265; M. SMITH, Triton and Harp Shells, p. 22, pl. 8, fig. 13.

Type locality: Acapulco, Mexico.

Occurrences: Recent—Acapulco, Mexico to Manta, Ecuador (M. SMITH, 1948). Pliocene—Jama formation, Puerto Jama, Ecuador, and Canoa formation, Punta Blanca, Ecuador (PILSBRY and OLSSON, 1941); Charco Azul formation, Burica Peninsula, Costa Rica (OLSSON, 1942). Remarks. This species has been considered conspecific with *D. constrictus* (BRODERIP, 1833) by WOODRING (1928:301). However, PILSBRY and OLSSON (1941:40) differentiate between the two aforementioned forms and conclude that they are distinct species, see remarks under *D. constrictus* (BRODERIP, 1833) and also see PILSBRY and OLSSON (1941, pl. 5) for comparative figures. OLSSON (1932:190) treats *D. ringens* (PHILIPPI, 1887) from the Tertiary of Chile as a subspecies of *D. decussatus* (VALENCIENNES, 1832). On the basis of available data, it is concluded that *D. simillimus* (SOWERBY, 1850) is questionably a paleo-subspecies of *D. decussatus*, and *D. gatunensis* Toula, 1909, is definitely a paleo-subspecies of *D. decussatus*.

djunggranganensis [*Persona*] MARTIN, 1914, Samm. Geol. Reischs-Mus. Leiden, neue folge, vol. 2, (4), p. 242, pl. 2, fig. 41.

Type locality: West Progo-beds, Java, (Miocene).

Remarks: This species possesses a well developed columellar notch which may indicate a possible ancestral affinity with *D. anus* (Linné, 1758).

floridana [*Personella*] GARDNER, 1947, U. S. Geol. Surv., Prof. Paper 142-H, p. 535, pl. 53, fig. 8.

Type locality: Shell Bluff, Shoal River, Walton County, Florida (Miocene).

Occurrence: Known only from the Shoal River formation, Miocene, Alum Bluff Group, Florida.

Remarks: DR. GARDNER followed DALL (1904:130) in granting *Personella* full generic rank, and placed *floridana* in this unit, which would extend the time range of *Personella* from Middle Oligocene to Middle Miocene.

floridana [*Distorsio*] OLSSON and MCGINTY, 1951, Nautilus, vol. 65, (1), p. 27, pl. 1, figs. 5, 6, 9, as a subspecies of *D. constrictus* BRODERIP, 1833. Not *Distorsio* (*Personella*) *floridana* (GARDNER, 1947), = *Distorsio mcgintyi*, new name, see citation in this catalogue to *mcgintyi* [*Distorsio*] new name.

Type locality: "off Palm Beach, Florida, 30-40 fathoms."

Remarks: The recent recognition of this distinct form living in Florida waters, as interpreted by OLSSON and MCGINTY, indicates the presence of a geographical subspecies of *D. constrictus* (BRODERIP,

1833), and suggests a homotaxic remnant of the fossil *D. simillimus* (SOWERBY, 1850) from the Miocene and Pliocene of the Caribbean area. The acquisition of a large series of this form may show that it is more closely related to *D. decussatus* (VALENCIENNES, 1832) than to *D. constrictus*, and actually represents a geographical subspecies of the former.

francesae [*Distorsio*] IREDALE, 1931, Records Australian Mus., vol. 28, (4), p. 213, pl. 23, fig. 2; IREDALE, 1929, Aust. Zoölogist, vol. 5, (4), p. 344, pl. 38, fig. 2, as *D. reticulata* 'Bolten' RÖDING, 1798, ALLAN, 1950, Austral. Shells, p. 115.

Type locality: Sydney Harbor, Australia.

Occurrences: North-west Island, Capricorn Group and Sydney Harbor, Australia (IREDALE, 1931; South Pacific to New South Wales (ALLEN: 1950).

Remarks: This species appears to have affinities with the East Indian *D. reticulata* 'Bolten' RÖDING, 1798, complex.

gatunensis [*Distorsio*] TOULA, 1909, Jahrb. K.-k. Geol. Reichsanstalt, vol. 58, p. 700, pl. 25, fig. 10; BROWN AND PILSBRY, 1911, Proc. Acad. Nat. Sci., Phila., vol. 63, p. 356, p. 26, fig. 8; OLSSON, 1922, Bull. Am. Paleo., vol. 9, p. 305; RUTSCH, 1930, Elogae Geol. Helvetiae, vol. 23, (2), p. 611, pl. 17, fig. 7, as *D. decussatus cf. gatunensis* Toul. Type locality: Panama Canal Zone (Miocene—Gatun formation).

Occurrences: Miocene—Gatun formation, Panama Canal Zone (TOULA, 1909; BROWN and PILSBRY, 1911; OLSSON, 1922), Banana River and Port Limon, Costa Rica (OLSSON, 1922); Buena Vista, Halbinsel Paraguana, Venezuela (RUTSCH, 1930).

Remarks: TOULA based the description of *D. gatunensis* on juvenile specimens from the Gatun formation of the Panama Canal Zone; BROWN and PILSBRY figured an apertural view of a mature specimen from the same formation. MAURY (1917:271; 1925:368) and OLSSON (1922:305) were of the opinion that *D. gatunensis* TOULA, 1909, was synonymous with *D. simillimus* (SOWERBY, 1850) from the Bowden Miocene; WEISBORD (1929:272) questioned this combination. WOODRING (1928:300) identified the Jamaican representative of the *D. clathrata* complex as "*Distorsio (Distorsio) clathratus gatunensis* TOULA"; several subsequent authors have followed this usage. However, RUTSCH (1930:611, pl. 17, fig. 6) figured the dorsal view of the holotype of *D. gatunensis* TOULA, 1909, and concluded that the species is a subspecies of *D. decussatus* (VALENCIENNES, 1832). As shown by RUTSCH, the holotype of *D. gatunensis* possesses double spiral cording on the shoulder of the body whorl, a characteristic of *D. decussatus*, while in *D. clathrata* (LAMARCK, 1816), the body whorl is sculptured with regularly spaced spirals lacking any indication of bilirate ridges or a keel on the shoulder. On the basis of Rutsch's data, *D. gatunensis* TOULA, 1909, is here considered to be a paleo-subspecies of *D. decussatus* (VALENCIENNES, 1832).

grasi [*Triton*] "BELLARDI" D'ANCONA, 1872, Comitato Geol. Regno, Mem. Descrizione della Carta Geol. d'Italia, vol. 2, p. 188, pl. 16, figs. 1a, 1b; BELLARDI, 1872, Mem. Accad. Sci. Torino, ser. 2, vol. 27, p. 262, pl. 14, fig. 18.

Type locality: "Piemonte" of Italy ("Pliocene").

Occurrences: "Miocene"—Termo-faurà Villa Forzano, Rio della Batteria, Castelnuovo d'Asti (Bellardi, 1872:263).

Remarks: This species is not referable to *Distorsio sensu stricto*; the apertural characters recall those which characterize the subgenus *Personella*.

interposita [*Distortio*] TATE, 1893, Jour. and Proc. Roy. Soc. New South Wales, vol. 27, p. 172, pl. 10, fig. 3.

Type locality: Bird-rock Bluff, near Geelong, Victoria, Australia ("Eocene").

Remarks: This species is not referable to *Distorsio sensu stricto* and apparently is restricted to an Australian paleo-faunal province.

jacksonensis [*Distortrix*] MEYER, 1885, Am. Jour. Sci., vol. 29, ser. 3, pp. 464, 468; MEYER and ALDRICH, 1886, Jour. Cincinnati Soc. Nat. Hist., vol. 9, (2), p. 50, in footnote, as a variety of *D. septemdentata* Gabb, 1860; HARRIS and PALMER, 1947, Bull. Am. Paleol., vol. 30, (117), p. 336, as a subspecies of *D. septemdentata* Gabb, 1860.

Type locality: "Jackson beds," Mississippi and Alabama (Eocene). Occurrences: Eocene—Moody's Branch marl, Jackson, Mississippi (HARRIS and PALMER, 1947).

Remarks: HARRIS and PALMER (1947:337) treat *jacksonensis* as a subspecies of *D. septemdentata* Gabb, 1860, from the Claiborne Eocene, and differentiate the two forms on the characters of the nuclear whorls. This species is referable to the subgenus *Personella*.

kueneni [*Persona*] KOPERBERG, 1931, Jaarb. van het Mijneuzen in Neder-Indië for 1930, vol. 7, pp. 118-119, as a subspecies of *D. reticulata* 'Bolten' RÖDING, 1798.

Type locality: Timor (Pliocene and Plio-Pleistocene).

Remarks: Koperberg compares his subspecies with *D. ridens* (REEVE, 1844), and *D. metableta* (COSSMANN, 1903), which have affinities with *D. reticulata* 'Bolten' RÖDING, 1798. Unfortunately, it has never been figured.

mcgintyi [*Distorsio*] new name, proposed for *Distorsio floridana* OLSSON and MCGINTY, 1951, Nautilus, 65, (1), p. 27, pl. 1, figs. 5, 6, 9, not *Distorsio floridana* (GARDNER, 1947), U. S. Geol. Surv., Prof. Paper 142-H, p. 535, pl. 53, fig. 8. At the suggestion of Mr. A. A. OLSSON (*in litteris*), we take pleasure in renaming this interesting discovery in honor of Mr. THOMAS MCGINTY, an enthusiastic collector and avid student of Florida shells. For additional data and remarks see citation in this paper to *floridana* [*Distorsio*] OLSSON and MCGINTY.

metableta [*Persona*] COSSMANN, 1903, Jour. de Conch., vol. 51, p. 159, pl. 6, figs. 4, 5.

Type locality: Karikal District, French India (Pliocene).

Remarks: COSSMANN states that this species has affinities with *Persona cancellina* "ROISSY" [LAMARCK, 1803] which = *D. reticulata* 'Bolten' RÖDING, 1798.

mulus [*Murex*] DILLWYN, 1817, Descript. Cat. Recent Shells, vol. 2, p. 704.

Type locality: "Coasts of Hitoe" [Ambon Island = Amboyna Island].

Remarks: DILLWYN refers to several references, including the figures of MARTINI (1773, pl. 41, figs. 405, 406) upon which *D. reticulata* 'Bolten' RÖDING, 1798, is based.

occidentalis [*Distorsio*] MÖRCH, 1877, Malak. Blätter Fort. Zeit. Malak., vol. 24, p. 34, as a subspecies of *D. acuta* (PERRY, 1811) = *D. reticulata* 'Bolten' RÖDING, 1798.

Localities cited: "St. Thomas, Guadeloupe, Jamaica, Carthagen, Tortola."

Remarks: All of Mörch's synonymy references are East Indian; however, all of the localities are West Indian. Inasmuch as there is no figure, it is difficult to ascertain what he had in mind when he proposed his subspecies.

perdistorta [*Distorsio*] FULTON, 1937, Proc. Malac. Soc. London, vol. 23, (1), p. 55; M. SMITH, 1948, Triton and Harp Shells, p. 22, fig. 11, as "*D. peridistorta*."

Type locality: Kii, Japan.

Occurrence: Recent—Japanese waters.

Remarks: Fulton states that this species possesses affinities with *D. ridens* (REEVE, 1844); it may represent a geographical subspecies of *D. reticulata* 'Bolten' RÖDING, 1798.

personatum [Triton] M. DE SERRES, 1829, Geogn. Terr. Tert., p. 118, pl. 3, figs. 11, 12 [not seen]; BELLARDI, 1872, Mem. Reale Accad. Sci. Torino, ser. 2, vol. 28, p. 261, in the synonymy of *D. tortuosa* Borson, 1821.

Type locality: Italy, ("Tertiary").

Remarks: BELLARDI (1872-261) places this species in the synonymy of *D. tortuosa* (Borson, 1821), from the Miocene and Pliocene of Italy.

pusilla [*Distorsio*] PEASE, 1860, Proc. Zool. Soc. London, p. 397; TRYON, 1881, Man. of Conch., vol. 3, p. 35; EDMONDSON, 1946, B. P. Bishop Museum, Spec. Pub. no. 22, p. 143.

Type locality: "Sandwich Islands."

Occurrence: Hawaiian Islands (PEASE, 1860; EDMONDSON, 1946).

Remarks: Inasmuch as Pease briefly described the species from beach material and did not figure it, many authors allocated the name to the *species dubium* category; however, its existence is verified by Edmondson (1946:143) and it would appear to be a geographical subspecies of *D. reticulata* 'Bolten' RÖDING, 1798.

reticulata [*Distorsio*] 'Bolten' RÖDING, 1798, Museum Boltenianum, pt. 2, p. 133; REEVE, 1844, Conch. Icon., vol. 2, Triton, pl. 12, fig. 45, as *T. cancellinus* Lamarck; MARTIN-ICKE, 1911, Geol. u. Pal. Ergeb. der Trinil-Exped., p. 49; TESCH, 1913, Jaarb. Mijnw. 1913, Verh., p. 161; TESCH, 1920, Pal. von Timor: 1, vol. 8, p. 69; Martin, 1891-1922, Samml. Geol. Reichsmus. Leiden, neue folge, vol. 1, p. 145; FISCHER, 1927, Pal. von Timor, vol. 15, p. 65; Martin, 1928, Wet. Meded. Dienst Mijnbouw, no. 10, p. 8; M. SMITH, Triton and Harp Shells, p. 23, pl. 8, fig. 10.

Type locality: none given.

Occurrences: Recent—Indo-Pacific Faunal Province. Miocene—West Sumatra (TESCH, 1913). Pliocene—Sondé-beds, Java (MARTIN, 1891-1922; Martin-Icke, 1911); North Sumatra (MARTIN, 1928); Timor (TESCH, 1920); Seran (FISCHER, 1927).

Remarks: This Indo-Pacific species has been confused by many authors with the West Indian species *D. clathrata* (LAMARCK, 1816), due to the fact that LAMARCK's (1822:186) re-evaluated description of this species included references to four figures of *D. reticulata* 'Bolten' RÖDING, 1798.

ridens [*Triton*] REEVE, 1844, Conch. Icon., vol. 2, *Triton*, pl. 12, fig. 46; REEVE, 1844, Proc. Zool. Soc. London, (12), p. 115; TRYON, 1881, Man. of Conch., vol. 3, p. 285, pl. 17, fig. 35, copy of Reeve's figure.
Type locality: Philippine Islands.

Remarks: This apparently represents a variant of *D. reticulata* 'Bolten' RÖDING, 1798.

ringens [*Tritonium*] PHILIPPI, 1887, Tert. und Quart. Verstein. Chiles, p. 56, pl. 4, fig. 9; OLSSON, 1932, Bull. Am. Paleo., vol. 19, (68), p. 189, as "*Distorsio decussatus ringens* PHILIPPI."

Type localities: Navidad and Matanzas, Chile ("Tertiary").

Occurrence: Fossil ("Tertiary"—Navidad and Matanzas, Chile (Philippi, 1887); Miocene—Lower Zorritos of Que and Zapotal, Peru (OLSSON, 1932).

Remarks: Philippi's species appears to represent, as indicated by Olson (1932:190), a paleo-subspecies of *D. decussatus* (VALENCIENNES, 1832), which is known in its Recent distribution to range as far south as Lobitas, Peru.

rotunda [*Distorta*] PERRY, 1811, Conch. or Nat. Hist. of Shells, pl. 10, fig. 2.

Type locality: "Southern Ocean."

Remarks: On the basis of the figure there is no doubt that this is a junior synonym of *D. anus* (Linné, 1758).

rugosa [*Distorta*] SCHUMACHER, 1817, Ess. Vers. Test., p. 249.

Type locality: none given.

Remarks: Schumacher in his synonymy refers this species to *D. anus* (Linné, 1758).

septemdentata [*Distorsio*] GABB, 1860, Jour. Acad. Nat. Sci. Phila., ser. 2, vol. 4, p. 380, pl. 67, fig. 21; CONRAD, 1865, Am. Jour. Conch., vol. 1, p. 21; TRYON, 1881, Man. of Conch., vol. 3, p. 6, pl. 3, fig. 15; COSSMANN, 1903, Eassais Paleo. Comp., vol. 5, p. 104, pl. 4, fig. 16; RENICK and STENZEL, 1931, Univ. Texas Bull., no 3101, pl. 6, fig. 7; WRIGLEY, 1932, Proc. Malac. Soc. London, vol. 20, (2), p. 136, pl. 2, fig. 18; Palmer, 1937, Bull. Am. Paleo., vol. 7, (32), p. 260, pl. 34, figs. 10, 11; GARDNER, 1945, Mem. Geol. Soc. Am., no. 17, p. 185, pl. 17, figs. 12, 13.

Type locality: Cook Mountain formation, Whellock or Caldwell Co., Texas (Middle Eocene), *vide* GARDNER (1945:185).

Occurrences: Eocene—Claibornian of Texas, Louisiana, and Mississippi, *vide* PALMER (1937:261), Alabama (GARDNER, 1945); Laredo formation, Nuevo Leon, Mexico (GARDNER, 1945).

Remarks: For synonymy and notes pertaining to this species see PALMER (1937:260) and GARDNER (1945:185). This is the type species of *Personella* CONRAD, 1865; it is found in the Upper Eocene Jackson beds in the form of *D. septemdentata jacksonensis* (MEYER, 1885).

smithi [*Persona*] VON MALTZAN, 1884, Nach. Deutschen Malak. Gesellschaft, vol. 16, (5), p. 5.

Type locality: Recent—Gorée, Africa, 20-25 meters.

Occurrence: known only from type locality.

Remarks: Maltzan provided a brief description in which he compared his species with *P. ridenti* REEVE [= ? *D. ridens* (REEVE, 1844), from the Philippines]. As this species was not figured, the generic assignment remains doubtful.

subclathratum [*Triton*] D'ORBIGNY, 1852, Prod. Pal. Strat. Univer. . . ., vol. 3, p. 77; BELLARDI, 1872, Mem. Reale Accad. Sci. Torino, ser. 2, vol. 28, p. 261, in the synonymy of *D. tortuosa* (BORSON, 1821).

Type localities: DAX, GAAS, LESBARRITZ, and ST. PAUL, Midi de la France, ("Tertiary").

Remarks: D'ORBIGNY refers to "*T.[riton] clathratum Gratteloup*⁴ [*sic*], 1847, [*sic*], pl. 1, no. 29, fig. 12 (*non* LAMARCK)" which Bellardi (1872:261) places in the synonymy of *D. tortuosa* (BORSON, 1821).

thersites [*Tritonium*] PHILIPPI, 1887, Tert. und Quat. Verstein. Chiles, p. 56, pl. 4, fig. 8; OLSSON, 1932, Bull. Am. Paleo., vol. 19, (68), p. 190.

Type locality: Navidad beds, Chile, no specific locality given ("Tertiary," ? Miocene).

Occurrences: known only from the original description.

Remarks: OLSSON (1932:190) compares this species with *D. clathrata* (LAMARCK, 1816), but its characters cannot be readily interpreted from the original description and illustration of the dorsal aspects.

tortuosus [*Murex*] BORSON, 1882, Mem. Reale Accad. Sci. Torino, vol. 26, p. 306, pl. 1, fig. 4; BELLARDI, 1872, (1), p. 231, pl. 14, fig. 17, pl. 15, fig. 4; COX, 1936, Mem. e Naticias Pub. Mus. Mineral. e Geol. Univ. Coimbra, no. 9, pp. 4, 13; VAN VOORTHUYSEN, 1944, Meded. Netherl. Geol. Stitching, ser. C—IV—no. 5, p. 54.

Type locality: "Lunghezza," Italy (Tertiary).

Occurrences: Miocene—Vienna Basin; Northern Germany?; Netherlands; S. W. France, Aquitanian, Burdigalian, Tortonian (van Voorthuysen, 1944). "Miocene"—Colli Torinesi, Termo-faurà, Rio della Batteria, Villa Farzano, Baldissero Albenga, Italy (Bellardi, 1872). Pliocene—Piemonte, Italy (Plaisancian and Astian); Rhône Valley, S. E. France, (Plaisancian); Catalonia, Spain (Plaisancian and Astian); Mina, Portugal (Cox, 1936).

Remarks: BELLARDI (1872:261) cites the principal synonymy of this species and records Italian Miocene and Pliocene occurrences. Cox (1936:13) lists the European Pliocene records.

⁴GRATELOUP, J., 1840, CONCHY. foss. des Terr. Tert. du Bassin de l'Adour, Atlas.

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